BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

IN RE APPLICATION OF:		Joseph J. SCHOTTLER et al.
SERIAL NO.	:	10/751,312
FILED	:	January 2, 2004
TITLE	:	METHOD OF DETERMINING AVERAGE CURRENT IN A PWM DRIVE
Group/A.U.	:	2121
Examiner	:	Michael B. Holmes
Conf. No.	:	2007
Docket No.	:	P06708US0-6025

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

This is an appeal from the final rejection of claims 1-6 and 8-10 dated December 26, 2007.

I. Real Party In Interest:

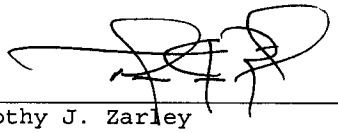
The real party in interest of the instant appeal is Sauer-Danfoss, Inc., having an address of 2800 East 13th Street, Ames, Iowa 50010.

II. Related Appeals and Interferences:

There are no related appeals or interferences.

CERTIFICATE OF MAILING (37 C.F.R. § 1.8(a))

I hereby certify that this document and the documents referred to as enclosed therein are being eFiled or deposited with the United States Postal Service as First Class mail addressed to: Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 27th day of May 2008.



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III. Status of the Claims:

Presently, claims 1-6 and 8-10 are pending in this application and appear as Appendix A of this brief. Claim 7 has been cancelled. Claims 1-6 and 8-10 are identified as the appealed claims.

IV. Status of Amendments:

No amendments have been filed or entered since the issuance of the Final Rejection on December 26, 2007.

V. Summary of Claimed Subject Matter:

Claim 1 relates to a method for driving the coil of an electrohydraulic valve 12 with a pulse width modulator drive, comprising the steps of transmitting a feedback signal 14 to a digitizing device 16 that is electrically connected to the electrohydraulic valve 12 (Specification at page 3, Detailed Description, first paragraph); sampling the feedback signal 14 within the digitizing device 16 to create a plurality of signal samples within one pulse width modulator cycle (Id. at page 3, Detailed Description, second paragraph); transmitting the plurality of samples to an accumulator 16 (Id. at page 3, Detailed Description, first paragraph); averaging the plurality of samples within the accumulator 16 to create an average value (Id. at page 3, Detailed Description, second paragraph); and transmitting the average value to a closed loop control algorithm 20 that generates a pulse width signal 22 to drive the coil of the electrohydraulic valve 12 (Id. at page 3, Detailed Description, second paragraph); wherein the accumulator resets when the algorithm sends the pulse width signal to the coil of the electrohydraulic valve such that the method of driving the coil of an electrohydraulic valve

with a pulse width modulator drive starts over again for a next pulse width modulator cycle. (Id. at page 3, lines 26-30). Claims 2-6 and 10 each depend from claim 1.

Claim 8 relates to a method of driving a pulse width modulator comprising the steps of transmitting a feedback signal 14 from the pulse width modulator to a finite impulse response filter (Id. at page 3, Detailed Description, first paragraph); calculating an average current in the signal within one pulse width modulator cycle with the finite impulse response filter (Id. at page 3, Detailed Description, second paragraph); and generating a pulse width signal 22 in response to the average current in the signal via an algorithm 20 (Id. at page 3, Detailed Description, second paragraph).

Claim 9 relates to a method of driving the electric coil of a machine with a pulse width modulator comprising the steps of transmitting a feedback signal 14 to a digitizing device 16 that is electrically connected to the electric coil of the machine (Id. at page 3, Detailed Description, first and second paragraph); calculating the amount of average current in the coil within one pulse width modulator cycle with the digitizing device 16 (Id. at page 3, Detailed Description, second paragraph); transmitting the average current amount to an algorithm 20 (Id. at page 3, Detailed Description, first paragraph); and generating a pulse width signal 22 in response to the average current in the coil with the algorithm 20 (Id. at page 3, Detailed Description, first paragraph).

VI. Grounds of Rejection to be Reviewed on Appeal

The Examiner has rejected Claims 1-4 and 8-10 under 35 U.S.C § 103(a) as obvious over US Pat No 5,012,722 to

McCormick (McCormick or '722) in view of US Pat No 7,247,955 to Tracy et al. (Tracy et al. or '955) and further in view of US Pat No 6,204,650 to Shimamori (Shimamori or '650). Claims 5-6 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over McCormick in view of Tracy et al., further in view of Shimamori, and further in view of US Pat No 6,249,418 to Bergstrom (Bergstrom or '418).

VII. Argument

Rejection under 35 U.S.C. § 103(a)

Claims 1-4 and 8-10

The Examiner has rejected Claims 1-4 and 8-10 under 35 U.S.C § 103(a) as obvious over McCormick in view of Tracy et al. and further in view of Shimamori. Appellant cannot agree and respectfully requests reversal of the final rejection.

Claims 1-4 and 7-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over McCormick in view of Tracy. Appellant cannot agree. First, Appellant asserts that each and every limitation of claim 1 is not presented in the prior art references and thus a *prima facie* case of obviousness has not been provided. The teachings or suggestions to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Appellant's disclosure. See In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991); MPEP § 2143. To establish a prima facie case of obviousness, all the claim limitations must be taught by the prior art. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 57 C.C.P.A. 1029, 1032 (1970).

Claim 1 in part requires "wherein the accumulator resets when the algorithm sends the pulse width signal to the coil

of the electrohydraulic valve such that the method of driving the coil of an electrohydraulic valve with a pulse width modulator drive starts over again for a next pulse width modulator cycle." The references cited in the office action do not teach this limitation and instead McCormick teaches the use of a microprocessor 100A that can provide an electronic cam function via formula relationship or looking up tables. (Col. 7, lines 47-61). However, McCormick does not teach the specific formulas (averaging) used or whether the microprocessor resets to start over the driving of the coil of the hydraulic valve as required by the claim.

Tracy does not cure McCormick. Instead, Tracy teaches the use of an FIR filter that uses a compensation algorithm 523 to compute and develop a new pulse width command for switch control signaling algorithm 524 using feedback information from preceding samples. (Col. 5, lines 57-60). Specifically, finite impulse response filter 527 may be in one example, a low pass averaging filter that averages the samples for several consecutive periods. (Col. 5, lines 24-45). However, the Tracy reference does not contemplate resetting the FIR filter 527 such that the method of driving the coil of an electrohydraulic valve with a pulse width modulation drive starts over again for a next pulse width modulation cycle.

Thus, to cure McCormick and Tracy the examiner cites to Shimamori as teaching the resetting limitation. Shimamori does not cure McCormick or Tracy. Nowhere does Shimamori teach resetting an accumulator when an algorithm sends a pulse width signal to the coil of an electrohydraulic valve as claimed. Shimamori in sum teaches the use of a timer to reset the PWM system. (Col. 14 lines 19-27). However, the claim limitation does not require that the accumulator only

resets, nor that the resetting function depend on time. Instead the claim requires the resetting function be dependant on what sends the pulse width signal and where the pulse width signal is sent. Shimamori does not teach resetting when a signal is sent from a control to a location, far less from a closed loop control algorithm to a coil of an elctrohydraulic valve. Instead Shimamori teaches resetting when a pre-determined amount of time has expired. (Col. 14 lines 19-27). Consequently the teaching of the prior art references when taken as a whole would not convey to one skilled in the art this limitation and the limitation causes the claim to be non-obvious.

Appellant asserts that even if all of the limitations of claim 1 are taught by the prior art references that there is no motivation, reason or would it be common sense to combine the prior art references to arrive at the claimed invention and the only way of doing so would be to use appellant's claim and specification as a blueprint. An obviousness analysis begins in the text of 35 U.S.C. § 103 with the phrase "at the time the invention was made." For it is this phrase that guards against entry into the "tempting but forbidden zone of hindsight" when analyzing the patentability of claims pursuant to that section. See Loctite Corp. v. Ultraseal Ltd., 781 F.2d 861, 873, 228 USPQ 90, 98 (Fed. Cir. 1985), overruled on other grounds by Nobelpharma AB v. Implant Innovations, Inc., 141 F.3d 1059, 46 USPQ 2d 1097 (Fed. Cir. 1998). Measuring a claimed invention against this standard requires the often difficult - but critical - step of casting the mind back to the time of the invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and then-accepted wisdom in the field. See, e.g., W.L. Gore & Assoc., Inc. v.

Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983).

The best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is the application of the requirement for a showing of the teaching or motivation to combine prior art references. See, e.g., C.R. Bard, Inc. v. M3 Sys., Inc., 157 F.3d 1340, 1352, 48 USPQ 2d 1225, 1232 (Fed. Cir. 1998)(describing "teaching or suggestion or motivation [to combine] as an essential evidentiary component of an obviousness holding")(But see KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727 (2007)(cautioning against rigid application of the the teaching, suggestion and motivation test, especially to the exclusion of common sense)). Still, "the invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time." See, e.g., Interconnect Planning Corp. v Feil, 774 F.2d 1132, 1138, 277 USPQ 543, 547 (Fed. Cir. 1985).

Evidence of a suggestion, teaching or motivation to combine may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem solved, although the suggestion more often comes from the teachings of the pertinent references. Rouffet, 149 F.3d at 1355. The range of sources available does not diminish the requirement for actual evidence. That showing must be clear and particular. See, e.g., C.R. Bard, 157 F.3d at 1352.

The McCormick reference is directed towards an electrohydraulic servo valve and control systems for the same. (Col. 1, lines 5-6). The system uses a programmable servo loop that has the ability to precisely control an electrohydraulic valve 11 is response to system conditions.

(Col. 7, lines 62-66). The valve operation can then be stored in a program ROM 204 that allows for manufacturing valves with wider tolerances which minimizes manufacturing costs. (Col. 7, line 66-Col. 8, line 14). Another advantage is replacing centering springs with LFM coil 54 that is driven by a PWM amplifier in a servo loop. (Col. 8, lines 15-19). By replacing the centering spring with a coil 54 driven by a PWM amplifier the coil 54 is unaffected by major resonances within the valve and motor thus increasing frequency response of the servo valve. (Col. 8, lines 15-27).

Tracy is directed toward a power conversion apparatus and methods and more particularly to power supply apparatuses and methods. (Col. 1, lines 7-9; and see final office action, pages 4-5). Specifically, Col. 5, lines 24-45 teach that a FIR filter 527, as an example, could be a low pass averaging filter that averages the samples for several constructive periods. Tracy then teaches a vector conversion algorithm 526 can be used. Tracy does not teach how a programmable servo loop can be used to precisely control a device or how a PWM amplifier can be used to combat resonances within a motor.

McCormick is not concerned with having a power conversion apparatus or improvements to power supply apparatuses. Additionally, Tracy does not involve an electrohydraulic valve or improvements to an electrohydraulic valve control system and consequently is not in the field of the inventor's endeavor. Further, common sense would not dictate combining the improved power supply of Tracy to improve the ability to control the valve in McCormick because there is no teaching that an increased power supply will result in better control. The only motivation or reason to combine Tracy with McCormick is to arrive at the claim

language. Thus, the motivation comes directly from Appellant's disclosure and the combination is a result of improper hindsight reasoning and Appellant asserts that the combination is non obvious. Consequently, Appellant respectfully requests reversal of the rejection.

Appellant also asserts that one skilled in the art would not have a reason or motivation to combine McCormick with Shimamori nor would common sense dictate their combination. As stated, McCormick is directed towards electrohydraulic valves having a programmable servo loop that can precisely control a high frequency valve 11 and overcome problems with resonances within a motor. (See Col. 7, line 62-Col. 8, line 14). Shimamori conversely is directed toward a power supply apparatus provided with a power supply circuit for generating a DC output. (Col. 1, lines 9-11). Again, McCormick is not concerned with a power supply apparatus or a circuit for generating a DC output. Instead, McCormick is directed towards a control system for precisely controlling an electrohydraulic valve. The only reason to use Shimamori is to arrive at the reset limitation of claim 1. Thus, the only motivation or reason to make the combination comes from Appellant's specification in order to meet the claim limitation and Appellant asserts that this is improper hindsight reasoning.

Additionally, common sense would not dictate the combination as resetting McCormick would eliminate the information gathered in the ROM 204 that is used in order to precisely control its electrohydraulic valve. (See McCormick, Col. 7, line 63-Col. 8, line 14). Because stored system conditions are required in McCormick the resetting features of Shimamori would not be desired by McCormick and common sense would dictate against resetting the program.

Consequently, there is no reason or motivation to combine Shimamori with McCormick and Appellant respectfully requests the rejection be reversed.

Independent claim 8 was rejected under 35 U.S.C. § 103 as being unpatentable over McCormick in view of Tracy also. Appellant reasserts that there is no reason to combine the McCormick and Tracy references as is argued above. Additionally, appellant asserts that each and every limitation of independent claim 8 is not met by a combination of the prior art references. Specifically, claim 8 in part requires "calculating the amount of average current in the coil within one pulse width modulator cycle with the digitizing device." According to the office actions the Tracy reference meets this limitation. Appellant cannot agree as Tracy specifically teaches an A to D converter 550 that samples output of output filter 540, e.g., phase to neutral voltages wherein these samples are averaged. (Col. 5, lines 24-45). Claim 8 specifically refers to the averaging of current and not voltages and thus Tracy does not anticipate this limitation. As a result, a combination of Tracy and McCormick will not result in the method of independent claim 8 and appellant respectfully requests allowance of said claim.

In response to this argument the Examiner disagrees, citing to Ohm's law. (Final Office action of 12/26/07). While Appellant understands that current is proportional to voltage, Ohm's law does not present that voltage and current are the same. The claim requires calculating average current and the Tracy reference teaches averaging voltages thus a difference exists and Tracy cannot cure McCormick regarding this limitation.

Independent claim 9, similar to independent claim 8, requires in part "calculating the amount of average current in the coil within one pulse width modular cycle with the digitizing device." As argued above, this limitation is not taught by Tracy as asserted by the examiner and thus the claim is non obvious in light of these references. Additionally, appellant reasserts there is no reason to combine McCormick and Tracy and thus respectfully requests allowance of claim 9.

In light of the above arguments appellant respectfully requests allowance of all pending claims 1-6 and 8-10.

Claims 5-6

Claims 5 and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over McCormick in view of Tracy et al., further in view of Shimamori, and further in view of Bergstrom. As set forth in detail above, and incorporated by reference as if fully restated herein, Appellant asserts that independent claim 1, from which each of claims 5 and 6 depend, is allowable over McCormick, Tracy et al., and Shimamori. As claims 5 and 6 are allowable subject matter, Appellant requests that the present rejection of the same be reversed.

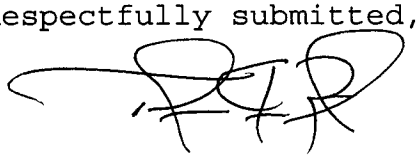
CONCLUSION

In light of the above arguments Appellant respectfully requests allowance of all pending claims 1-6 and 8-10.

The appeal brief fee in the amount of $500 was paid on May 30, 2007. We are submitting payment of $10.00 for the increase in fees to be charged to our Deposit Account. No other fees or extensions of time are believed to be due in connection with this response; however, consider this a

request for any fees or extensions inadvertently omitted, and charge any additional fees to Deposit Account 50-2098.

Respectfully submitted,



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- TJZ/JRJ -

Attachment: Appendix

APPENDIX

VIII. Claims Appendix

1. A method of driving the coil of an electrohydraulic valve with a pulse width modulator drive, comprising:
transmitting a feedback signal to a digitizing device that is electrically connected to the electrohydraulic valve;
sampling the feedback signal within the digitizing device to create a plurality of signal samples within one pulse width modulator cycle;
transmitting the plurality of samples to an accumulator;
averaging the plurality of samples within the accumulator to create an average value; and
transmitting the average value to a closed loop control algorithm that generates a pulse width signal to drive the coil of the electrohydraulic valve;
wherein the accumulator resets when the algorithm sends the pulse width signal to the coil of the electrohydraulic valve such that the method of driving the coil of an electrohydraulic valve with a pulse width modulator drive starts over again for a next pulse width modulator cycle.

2. The method of claim 1 wherein the digitizing device is an AtoD converter.

3. The method of claim 1 wherein the digitizing device is a DSP.

4. The method of claim 1 wherein the digitizing device is a micro controller.

5. The method of claim 1 wherein the algorithm is a PI algorithm.

6. The method of claim 1 wherein the algorithm is a PID algorithm.

8. A method of driving a pulse width modulator comprising:
transmitting a feedback signal from the pulse width modulator to a finite impulse response filter;
calculating an average current in the signal within one pulse modulator cycle with the finite impulse response filter; and
generating a pulse width signal in response the average current in the signal via an algorithm.

9. A method of driving the electric coil of a machine with a pulse width modulator comprising:
transmitting a feedback signal to a digitizing device that is electrically connected to the electric coil of the machine;
calculating the amount of average current in the coil within one pulse width modulator cycle with the digitizing device;
transmitting the average current amount to an algorithm;
generating a pulse width signal in response to the average current in the coil with the algorithm.

10. The method of claim 1 wherein the digitizing device is a finite impulse response filter.

IX. Evidence Appendix

None

X. Related Proceedings Appendix

None